Corn is a grass and has a fibrous type root system, as compared to soybeans or alfalfa that have tap root systems. Successful establishment of the corn plant’s root system helps ensure successful establishment of the crop itself. In fact, when you are attempting to diagnose the cause of stunted or otherwise poor-looking corn early in the season, the first place to begin the search is below ground.

One of the more critical periods for successful root establishment occurs from emergence to about the six-leaf collar stage of development (V6). Stunting or restriction of the root system during this time period (e.g., dry soil, wet soil, cold soil, insect damage, herbicide damage, sidewall compaction, tillage compaction) can easily stunt the entire plant’s development.

To better understand rooting development and problems associated with root restrictions, it is important to understand that root development in corn can be characterized by root position relative to the seed. Seminal roots originate near the seed and are comprised of the radicle and lateral seminal roots. The seminal root system anchors the young plant and absorbs small amounts water and nutrients for the first two to three weeks. Seminal roots cease new growth shortly after the coleoptile emerges at the soil surface.

Within a few days after the emergence of the coleoptile and first true leaf, the nodal root system begins to develop from the crown area of the seedling and is distinctly visible by growth stage V1. An individual set of nodal roots forms at each stalk node belowground plus one or more aboveground nodes. By growth stage V6, these nodal roots are typically well established and have completely taken over the sustenance of the plant.

The “woody” triangle of stalk tissue visible at the lower end of a split corn stalk usually represents four stalk nodes with no spaces (internodes) between them. The internode above the fourth node elongates about 1/2 inch, above which is found the fifth node (still below or just at the soil surface). Consequently, five sets of nodal roots will usually be detectable below ground (one set for each below ground stalk node).

Elongation of the internode (1-inch or greater) above the fifth node elevates the sixth node above ground. Continued elongation of subsequent stalk internodes will result in higher and higher placement of the remaining stalk nodes. Additional sets of nodal roots that form at above ground stalk nodes are usually assigned the “fancy” name of brace roots, but are functionally identical to those nodal roots that form below ground. If
surface soil conditions are suitable (moist and not excessively hot), brace roots can successfully enter the soil, proliferate and effectively scavenge the upper soil layer for water and nutrients.

Because a young corn seedling depends primarily on the energy reserves of the kernel until the nodal roots develop, damage to the seminal roots or the mesocotyl prior to successful nodal root formation will cause stunting or death of the plant. Examples of such damage include salt injury from excessive rates of starter fertilizer, seedling blight, herbicide injury and insect feeding damage.

Cool soils slow the development the development of nodal roots and prolongs the seedling’s dependence on the dwindling kernel reserves. Such delayed plant development extends the vulnerability of the seedling to damaging soil-borne pathogens, insects or pesticides prior to successful nodal root establishment.

Cool soils that have been saturated for lengthy periods during the first 30 days after planting, coupled with numerous cloudy days and lower photosynthetic rates, naturally result in early-planted fields of corn whose appearance can be most politely described as pathetic. The prognosis for such fields is greatly dependent on weather conditions over the next several weeks as the crop tries to move along into the rapid growth period (knee-high to pre-tassel). A return to warm temperatures with decent, but not excessive, rainfall will do wonders for many of the early-planted cornfields around Indiana this year.

**Related References:**


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